Evaluation of Delta Smelt Holding at the Tracy Fish Collection Facility

Investigators

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Summary

The Tracy Fish Collection Facility (TFCF) uses a louver-bypass system to separate fish from exported flows. Entrained fish are guided into large collection tanks [about 6.1m (20 ft) diameter, 4.6 m (15 ft) high where they are held up to 24 h in moderate velocity (0.18–0.9 m/s (0.6–3.1 ft/s)] with ambient aquatic debris. Fish holding time is dependent on fish density and time of year. Typically, fish are held for 8 h in the spring when delta smelt (*Hypomesus transpacificus*) are present, 12 h in the winter when Chinook salmon (*Oncorhynchus tshawytscha*) smolts are present, and 24 h the remainder except when either fish density or debris load is high (based on guidelines in Bates *et al*. 1960). After holding duration, entrained fish are concentrated into a 1,900-L, (500-gal) lift bucket and moved to a transport truck. Holding tank experiments with Sacramento blackfish (*Orthodon microlepidotus*) suggested that holding conditions cause minimal scale loss, although pre-experimental scale loss was high and may have masked experimentally induced injury (Karp and Lyons 2008). In the present study, we used delta smelt and 96-h survival as a final measure for evaluating holding tank stress. Delta smelt were selected because they are present in the wild entrainment and are one of the more vulnerable fish species encountered at the TFCF.

Problem Statement

Holding conditions at the TFCF may be injurious to the more sensitive fishes, particularly delta smelt. Delta smelt is protected by the Endangered Species Act and thus, we are required to reduce impacts to delta smelt while they are held at the TFCF. The purpose of this study is to determine if current holding conditions damage or kill hatchery reared delta smelt.

Goals and Hypotheses

Goal:

1. Determine if delta smelt can be held for up to 8 h in the holding tank with wild entrainment.

Hypothesis:

1. No significant 96-h mortality occurs from confinement in the holding tanks.

Materials and Methods

Fish release-recovery experiments were used and all fish were acclimated to ambient Delta water conditions for 7 days prior to use. Adult delta smelt were obtained from the University of California Davis' Fish Conservation and Culture Laboratory, Skinner Fish Protection Facility, Byron, California. These were held in flow-through 750-L (198-gal) tanks in well water (18 ^{o}C) and fed Silver Cup salmon feed. Two weeks prior to testing, 8 groups of 60 fish were fin tagged with fluorescent microbeads (New West Technology, Arcata, California) so that each group was uniquely marked. The holding tank was filled with water at the beginning of each 8-h experiment. For each release, 20 of one tag (=control) and 20 of another tag were transported to the holding tank area in black 18.9-L (5-gal) buckets. One group was designated control and placed into the 96-h 1135-L (300-gal) follow-up tank. The other group of 20 fish was released into the holding tank. This was repeated at 4 h and again at 8 h. After 8 h, the holding tank was drained, and all fish (experimental and wild entrainment) were concentrated into the 1,900-L lift bucket for sorting and recovery. A final group of 40 fish were then transported to the holding tank area for the "lift bucket" only release (20 as control and 20 released into the lift bucket). We then sorted through the contents of the lift bucket in a 1,900-L sorting tank. Experimental fish were recovered and placed into the 96-h tank (one 96 h follow-up per 8-h experiment). Thus, for each 8-h experiment, four groups of control fish and four groups of recovered experimental fish were held together for 96 h follow-up. These tanks were checked daily for mortalities. All fish were visually examined for obvious injury prior to use, and measured after 96 h. A total of ten 8-h experiments were conducted. Analysis of variance will be used to determine if delta smelt survival was similar between fish held in the TFCF holding tank with wild entrainment versus fish that were placed directly into the 96-h post-experimental follow-up tank.

Coordination and Collaboration

These studies were coordinated with the University of California Davis' Fish Conservation and Culture Laboratory, Skinner Fish Protection Facility, Byron, California, and the Tracy Fish Collection Facility staff.

Endangered Species Concerns

Incidental "take" of ESA listed salmon, steelhead, and delta smelt was possible and any wild sensitive fish were returned to Delta waters as quickly as possible. The total number of each ESA species incidentally caught or collected during the experiment

was sent to the reporting agencies. Incidental take from this research was covered under the TFCF Section 10 permit.

Dissemination of Results (Deliverables and Outcomes)

A final Tracy Technical Report Series report will be completed in FY 2010 and final results reported to the Tracy Technical Advisory Team.

Literature Cited

Bates, D.W., O. Logan, and E.A. Pesonen. 1960. *Efficiency evaluation, Tracy Fish Collection Facility, Central Valley Project, California*. Bureau of Reclamation, Sacramento, California.

Karp, C. and J. Lyons. 2008. *Evaluation of fish holding at the Tracy Fish Collection Facility*. Tracy Fish Facility Studies, Volume 39. Bureau of Reclamation, Mid-Pacific Region and Denver Technical Service Center.